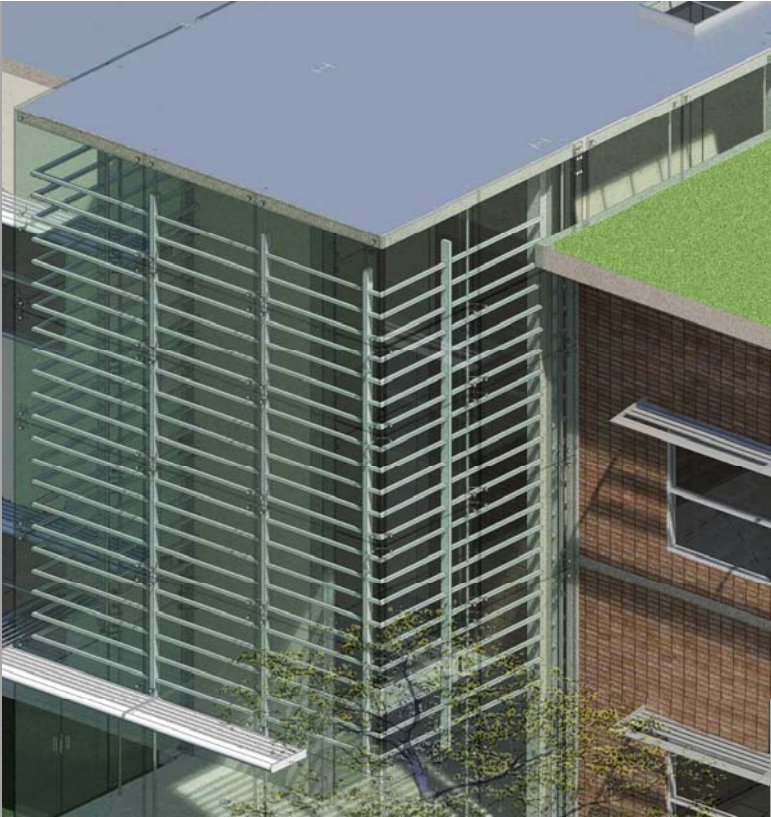


Group 2 : BIM²

THE PENNSYLVANIA STATE  
UNIVERSITY

FINAL PRESENTATION

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



Group 2 : BIM²
GOAL OVERVIEW
DESIGN TIMELINE
GOAL ACCOMPLISHMENTS
BIM OVERVIEW
ANDRES PEREZ - STRUCTURAL ENGINEER DAN COX – ELECTRICAL ENGINEER DYLAN SALMONS – LANDSCAPE ARCHITECT KAUSTAV GUPTA - ARCHITECT NICOLE DUBOWSKI – MECHANICAL ENGINEER NICK UMOSELLA – CONSTRUCTION MANAGER

DESIGN GOALS

- 1. Beyond LEED
- 2. Efficient collaboration amongst each other
- 3. Effective Value Engineering
- 4. Look at *Lifetime vs. Initial* cost
- 5. System optimization through IPD and BIM
- 6. Effective & beneficial educational environment for children

GOALS WITH BIM

- 1. Utilization of 3D software and Integrated analysis programs
- 2. Develop efficient and effective Information flow and management
- 3. Early and Effective clash detection amongst disciplines
- 4. Discovery of pros and cons of a developing design platform

Group 2 : BIM²

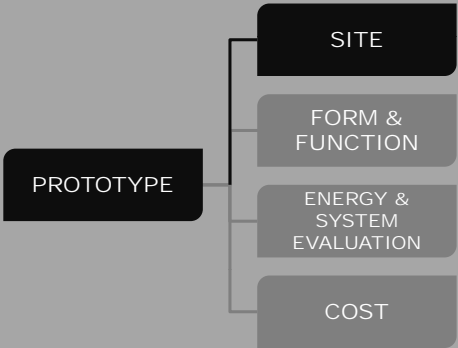
GOAL OVERVIEW

DESIGN TIMELINE


GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



SITE



- The entire site is good in terms of soil bearing capacity
- The green zone need to be preserved as much as possible
- Considering the slope and sun path, the building should be relocated
- Utilities should be provided mostly from the road on south
- The sports field should be adjacent to the existing sports facilities

3

Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

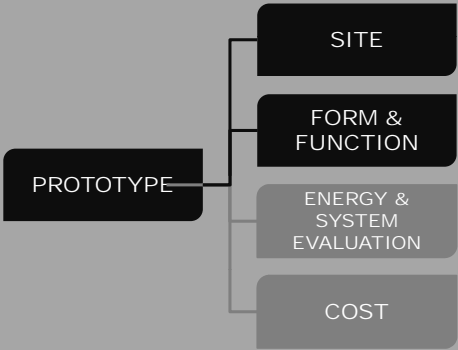
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



BUILDING FORM AND FUNCTION

The image displays two architectural drawings. The top drawing is a detailed floor plan of a building, characterized by a central blue square core and a red cross-shaped corridor system. Various rooms are color-coded in shades of green, yellow, and brown. A north arrow is located in the bottom-left corner. The bottom drawing is a cross-section of the building, showing the roof structure and internal spaces, with yellow highlights indicating specific areas. Below this section drawing is the caption 'SECTION: ROOF AND DAYLIGHTING'.

5

Group 2 : BIM²

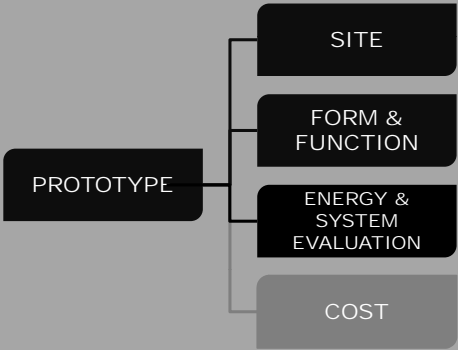
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX – ELECTRICAL ENGINEER  
DYLAN SALMONS – LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI – MECHANICAL ENGINEER  
NICK UMOSELLA – CONSTRUCTION MANAGER

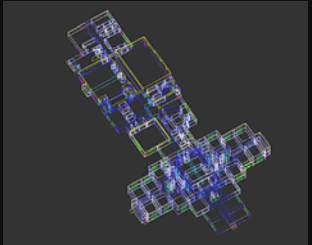
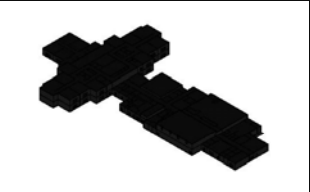


ENERGY & SYSTEM EVALUATION

Existing System – Water Source Heat Pumps

Baseline Energy Modeling – IES VE with Revit Plug-In

Set Design Goals



Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

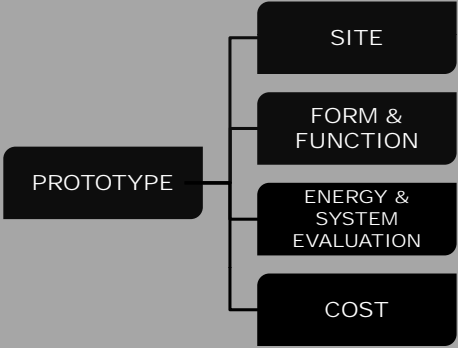
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



COST

Steel Tube Institute

OF NORTH AMERICA

HSS Columns

Pros

- Greater Strength to weight ratio than Wide-flanges
- Save on shipping costs (less weight)
- More Sustainable (less steel used)

Cons

- Must Weld Connections

Square Foot Estimate of Building

- Total square footage of building: 94,716 SF
- Base Square Foot Value : \$153.42 per sq. ft.
- Total Base Estimation: \$18,372,000
- Assumptions: Steel frame structure with face brick, 1 year design and 1 year construction.
- Excludes: Major site work, sustainable features and their upfront costs

Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

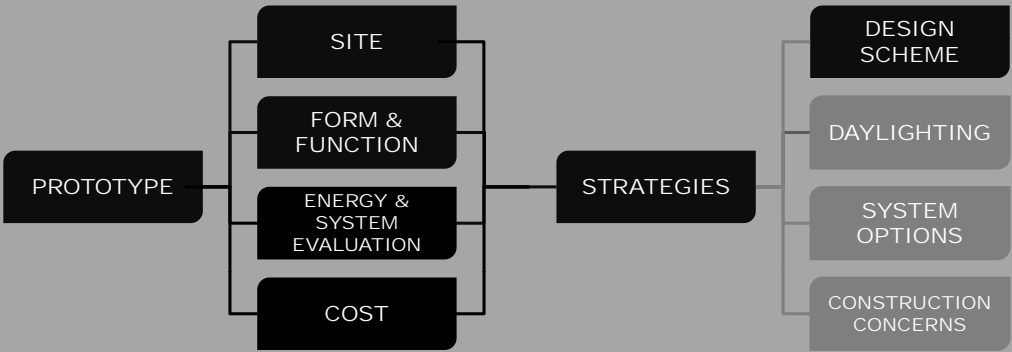
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



DESIGN SCHEME

8

Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

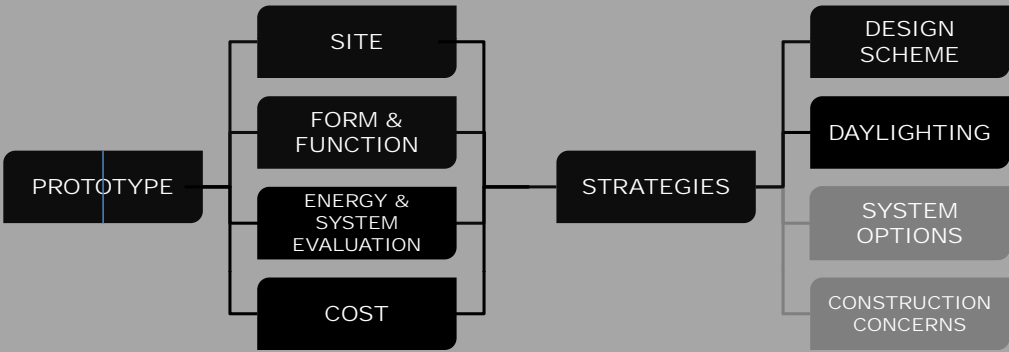
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



DAYLIGHTING

Location: Reading, United Kingdom

Latitude: 51° 32' 0" N

Longitude: 1° 12' 0" W

Time Zone: GMT

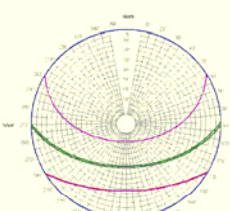
Daylight Saving: Not observed

Start Date: 1/1/2012

End Date: 1/1/2012

Time Step: 15 min

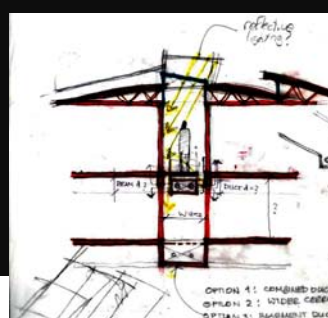
File: Daylighting.dgn

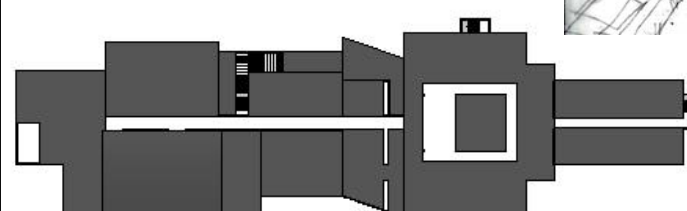


Option 1: 100% Glazing

Option 2: 50% Glazing

Option 3: 25% Glazing







Group 2 : BIM²

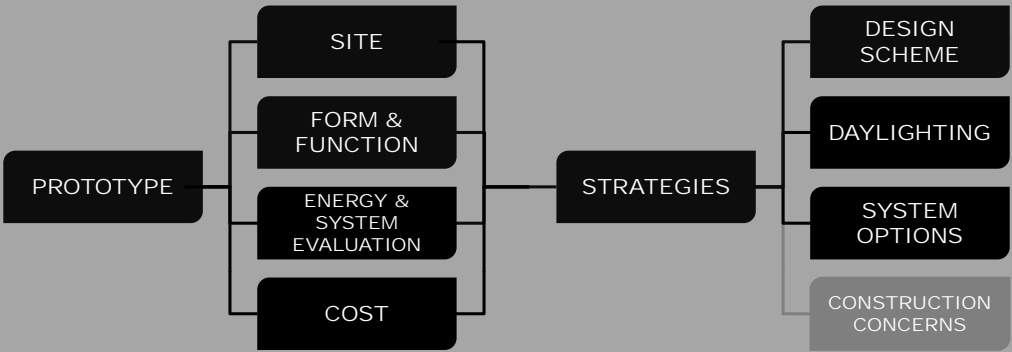
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



SYSTEM OPTIONS

Specific Design Goals for Integrative System Design

Performance Requirements  
Capacity Requirements  
Spatial Requirements  
Area  
Height  
Location  
Initial Cost  
Operating Cost  
Reliability  
Flexibility  
Maintainability  
Sustainablility

11

Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

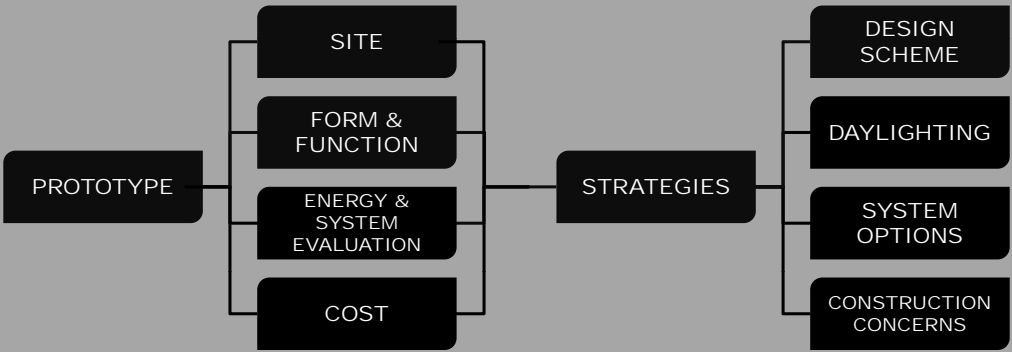
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

KAUSTAV GUPTA - ARCHITECT

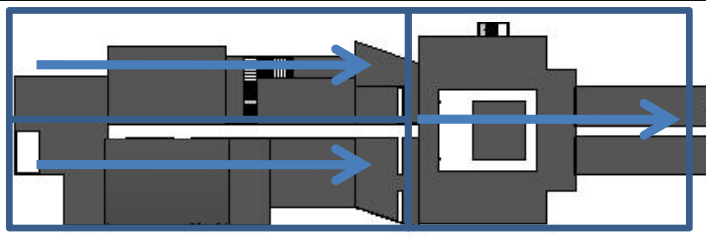
NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



CONSTRUCTION CONCERNS

- Large Lead Items
- Steel Trusses
  - Mechanical systems
  - Fenestration
- Cost Items
- Decision to go with Composite Beam System
  - Conducted a new SF cost: \$21,000,000
- Initial Construction Phasing
- Three crews moving west to East
  - Eventually changed



Group 2 : BIM²

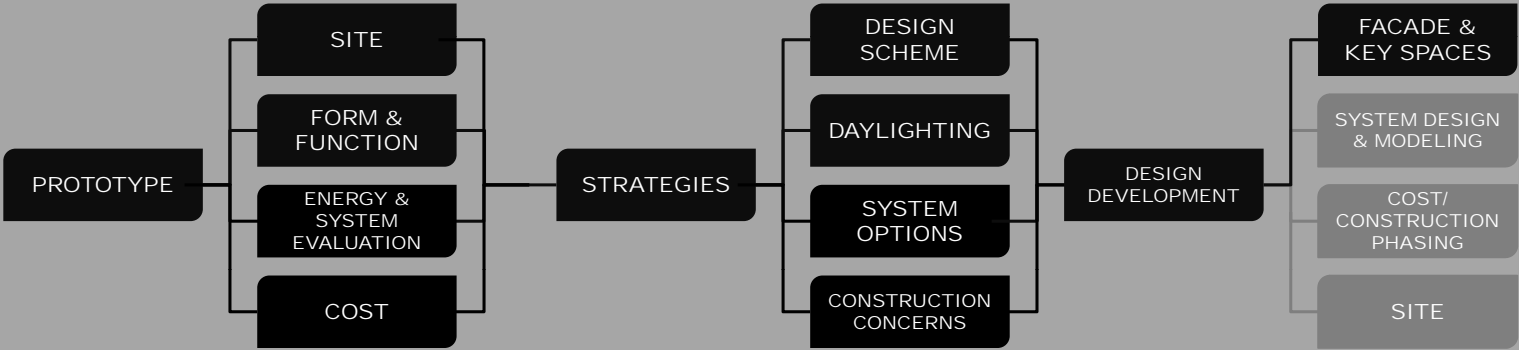
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER

ARCHITECTURAL SPACES :  
FIRST FLOOR



Department Legend

ADMIN
CAFETERIA
CLASSROOM
CORRIDOR
FACULTY
GYMNASIUM
KITCHEN
LEARNING SUPPORT
MEDIA ROOM
NURSE
RESTROOM
STAIR
STORAGE
UTILITY

Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER

ARCHITECTURAL SPACES :  
SECOND FLOOR



Department Legend

- ADMIN
- CAFETERIA
- CLASSROOM
- CORRIDOR
- FACULTY
- GYMNASIUM
- KITCHEN
- LEARNING SUPPORT
- MEDIA ROOM
- NURSE
- RESTROOM
- STAIR
- STORAGE
- UTILITY

Group 2 : BIM²

GOAL OVERVIEW

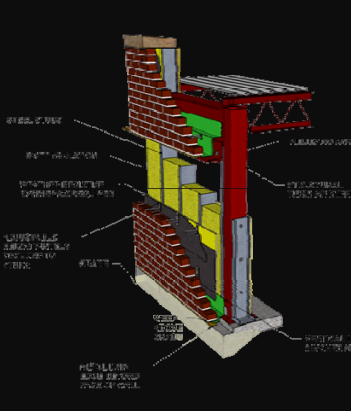
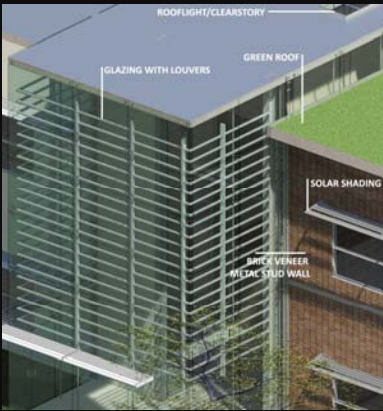
DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX – ELECTRICAL ENGINEER  
DYLAN SALMONS – LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI – MECHANICAL ENGINEER  
NICK UMOSELLA – CONSTRUCTION MANAGER

FACADE





Group 2 : BIM²

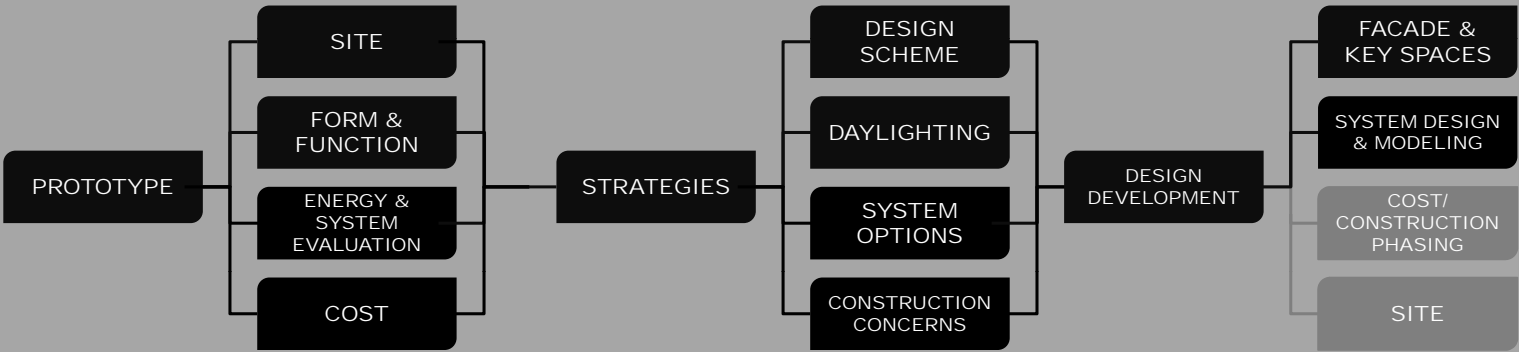
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



STRUCTURAL SYSTEM & MODEL

Revit

RAM

Structural Design Summary

- Structural Steel
- Braced Frame w/ Moment Frames as needed
- Composite Beam System

Design Process

- Laid out structural grid in Revit following architectural layout
- Used Revit-RAM Interoperability link to put in RAM
- Put designed gravity system back in Revit

16

Group 2 : BIM²

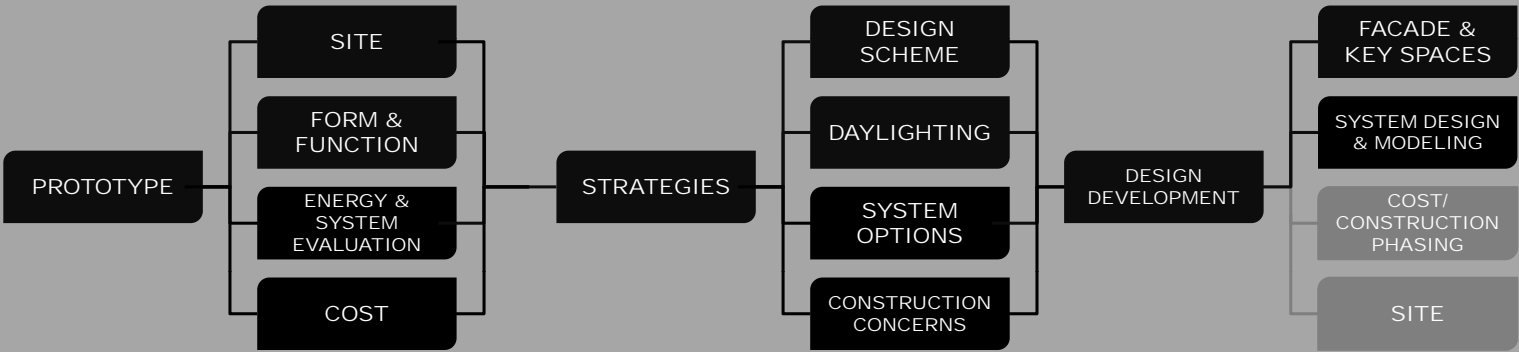
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



System Modeling in Revit MEP

17



Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

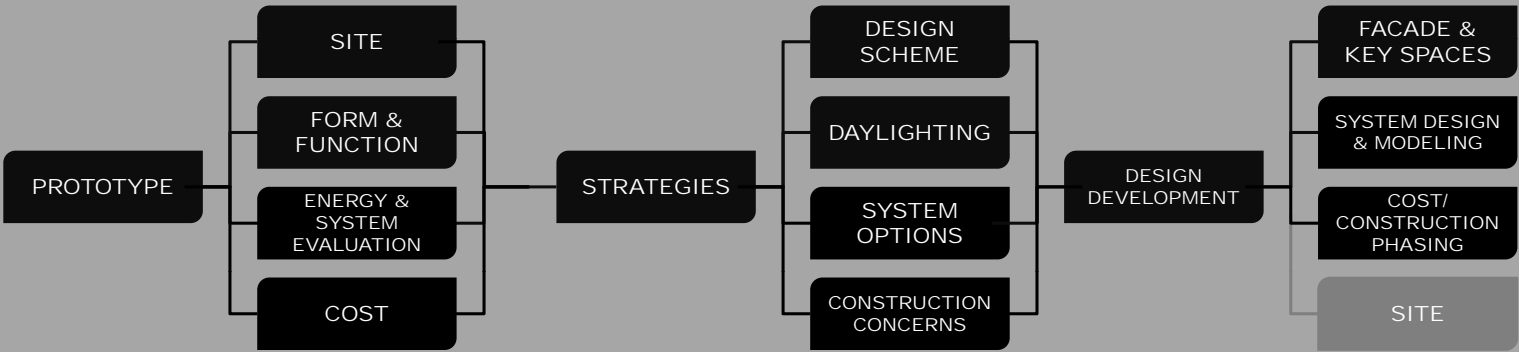
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

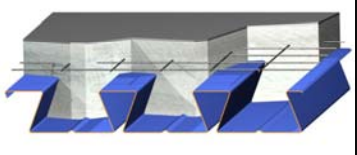
KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER

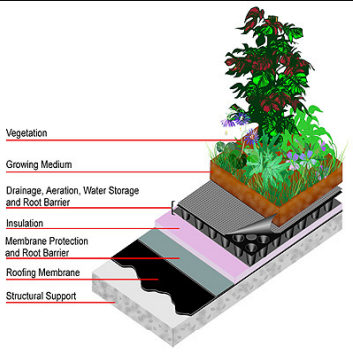


COST



Began Taking Cost Assembly Cost Estimates to Create a More Accurate Estimate

Systems are Now Defined



20

Group 2 : BIM²

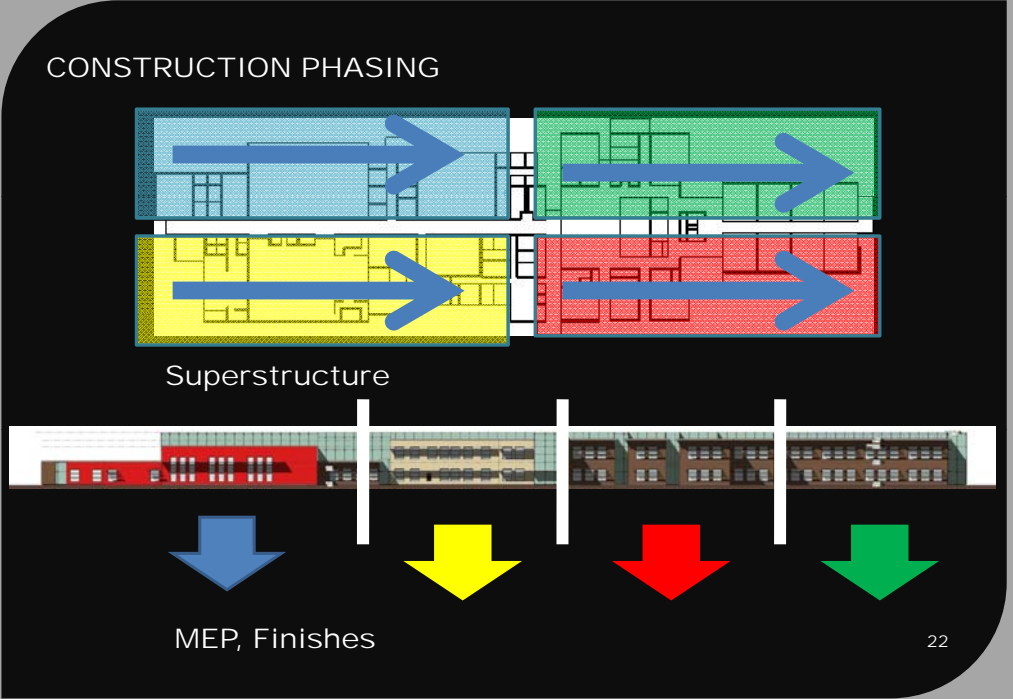
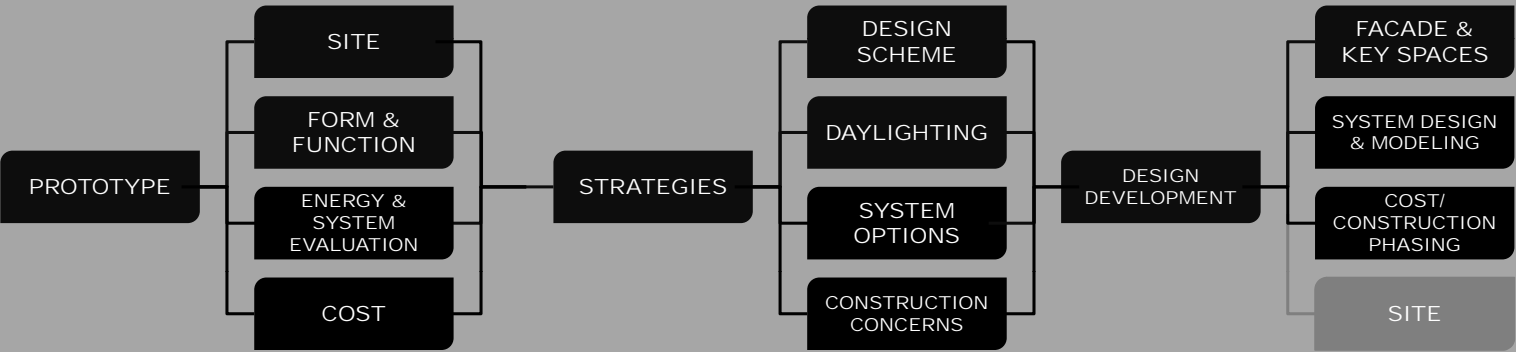
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



Group 2 : BIM²

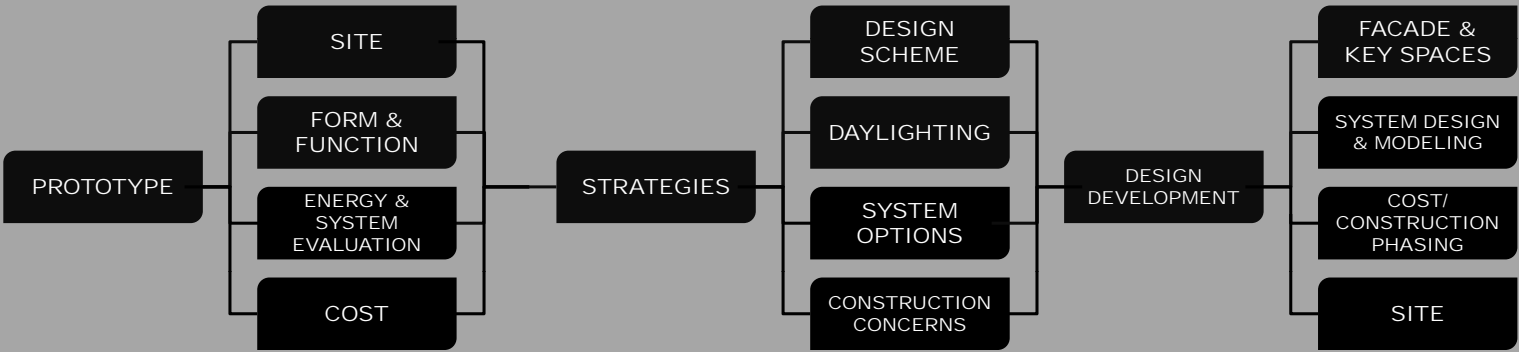
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



Group 2 : BIM²

GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER

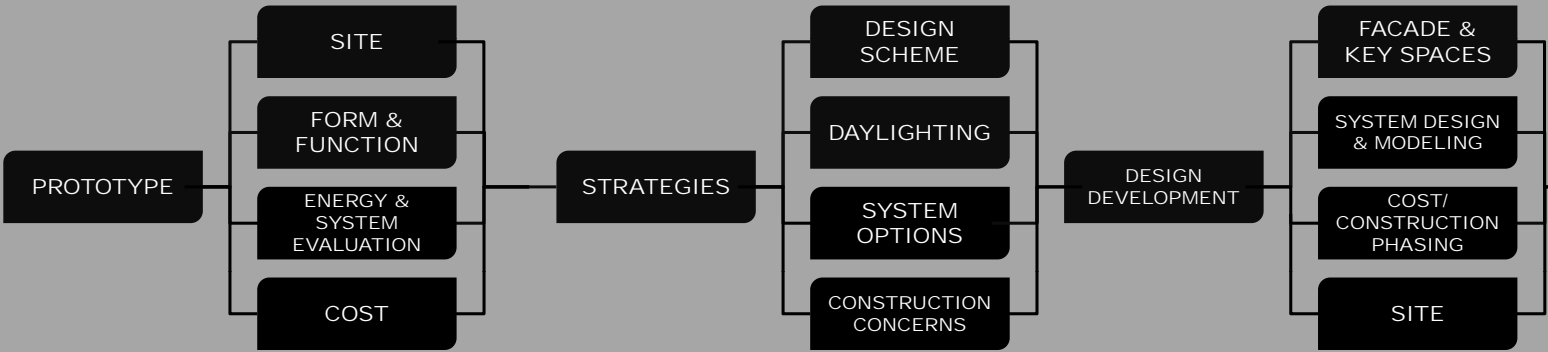
DAN COX - ELECTRICAL ENGINEER

DYLAN SALMONS - LANDSCAPE ARCHITECT

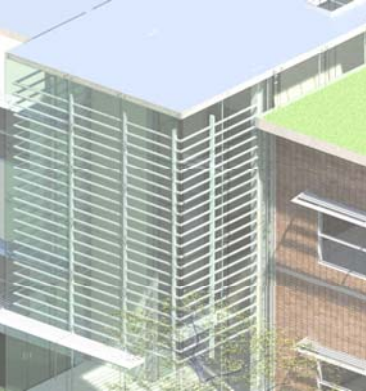
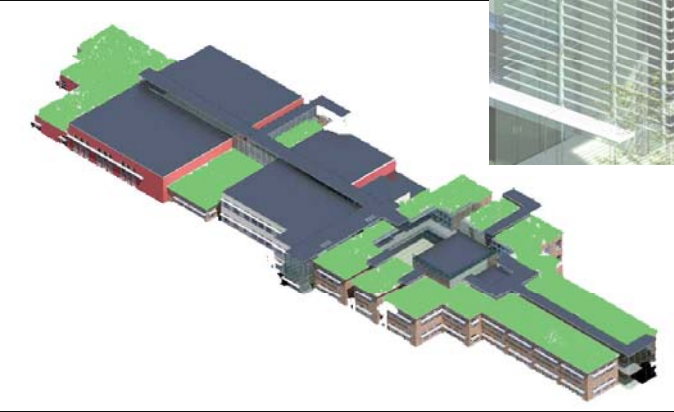
KAUSTAV GUPTA - ARCHITECT

NICOLE DUBOWSKI - MECHANICAL ENGINEER

NICK UMOSELLA - CONSTRUCTION MANAGER



DAYLIGHTING



Group 2 : BIM²

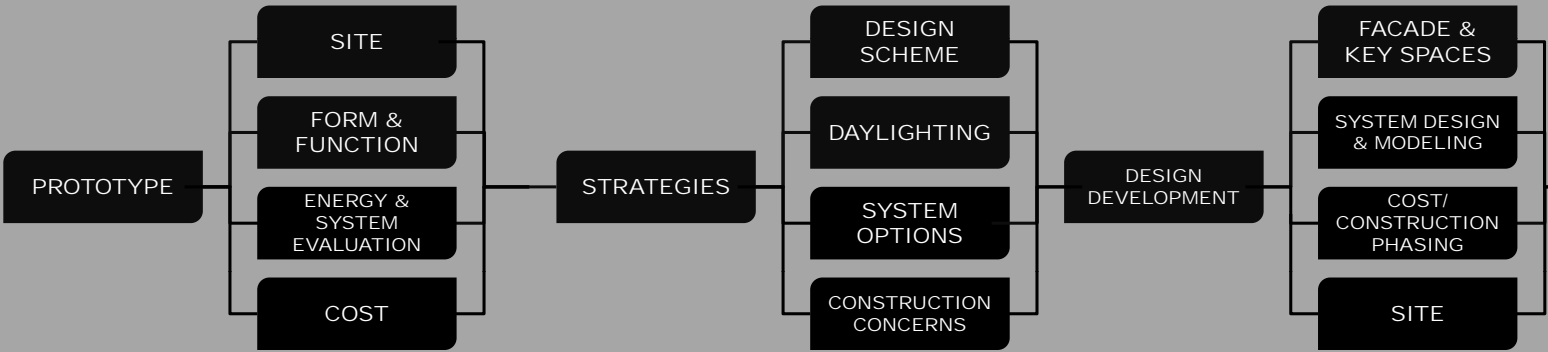
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



BIM ESTIMATE

Total Number of 3/4" studs	Family and Type	lb/Ft	Quantity
5967	K-Series Bar Joist-Angle Web: 10K1	5	263
	K-Series Bar Joist-Angle Web: 12K1	5	29
	K-Series Bar Joist-Angle Web: 16K2	5.5	48
	K-Series Bar Joist-Angle Web: 16K4	7	14
	K-Series Bar Joist-Angle Web: 18K3	6.6	9
	K-Series Bar Joist-Angle Web: 18K4	7.2	26
	K-Series Bar Joist-Angle Web: 20K4	7.6	9
	K-Series Bar Joist-Angle Web: 22K5	8.8	25
	K-Series Bar Joist-Angle Web: 24K7	10.1	20
	K-Series Bar Joist-Angle Web: 26K9	12.2	40
	LH-Series Bar Joist: 36LH10	21	11
	LH-Series Bar Joist: 40LH12	25	16

Revit Schedules Help Create Quantity Take Offs

Group 2 : BIM²

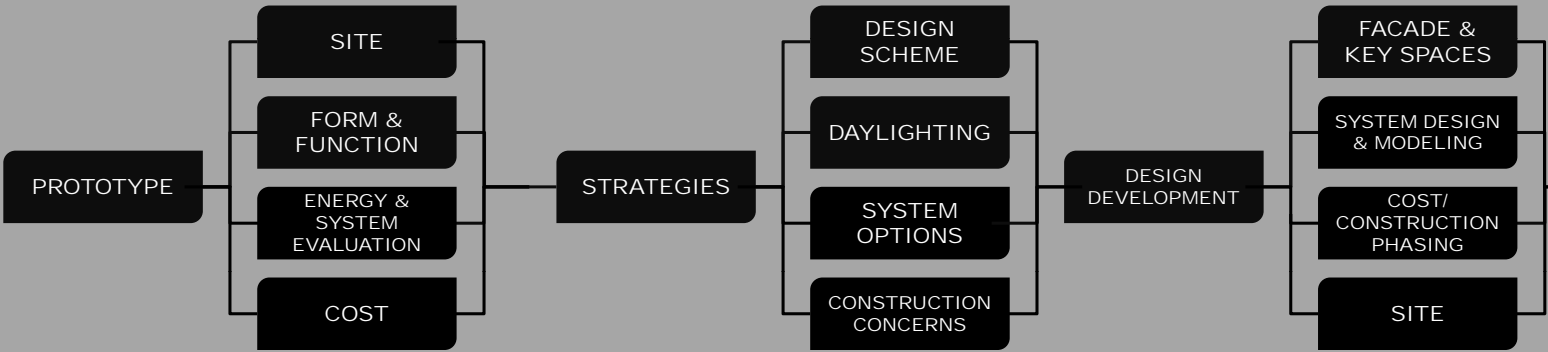
GOAL OVERVIEW

DESIGN TIMELINE

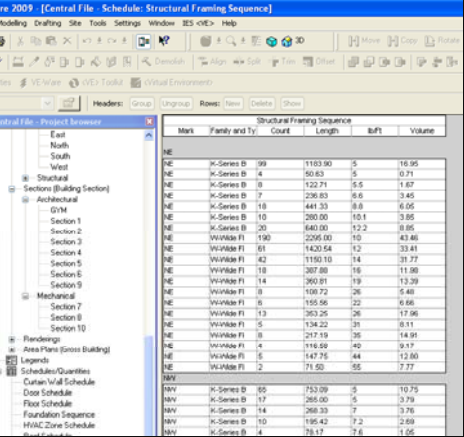
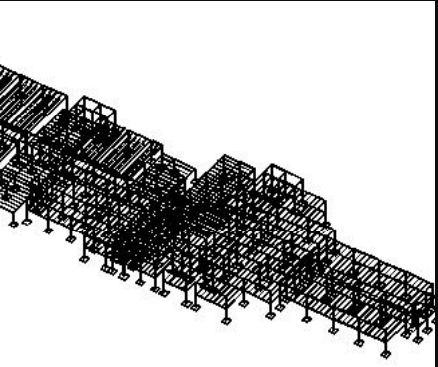
GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX – ELECTRICAL ENGINEER  
DYLAN SALMONS – LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI – MECHANICAL ENGINEER  
NICK UMOSELLA – CONSTRUCTION MANAGER



BIM CONSTRUCTION SEQUENCE--Superstructure



Revit

Group 2 : BIM²

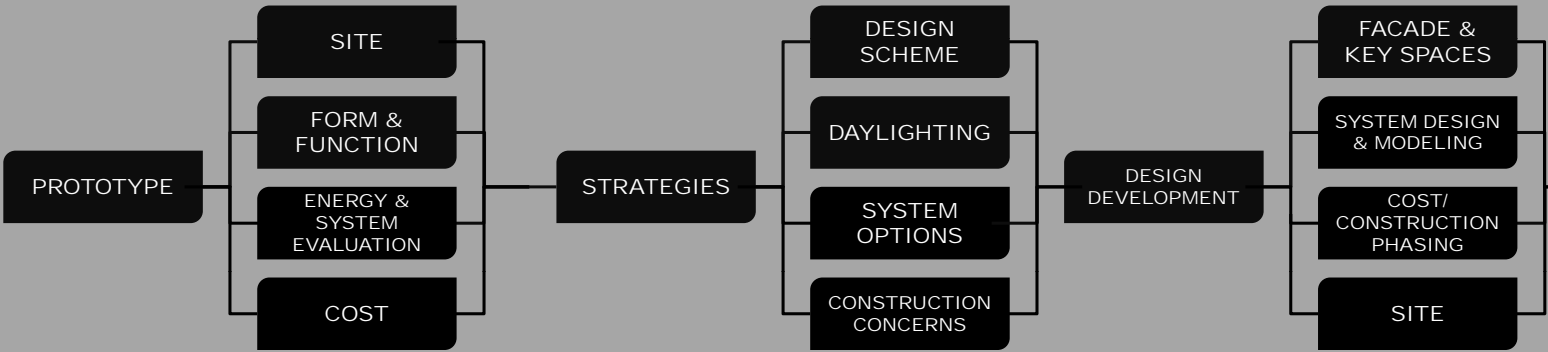
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



BIM CONSTRUCTION SEQUENCE--Superstructure

Navisworks—4D Sequence

Group 2 : BIM²

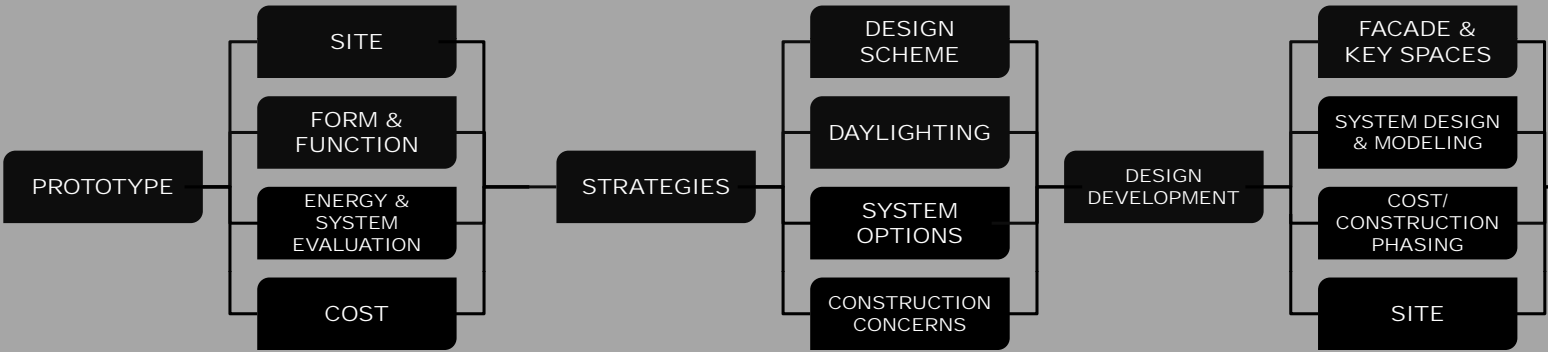
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS


BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER

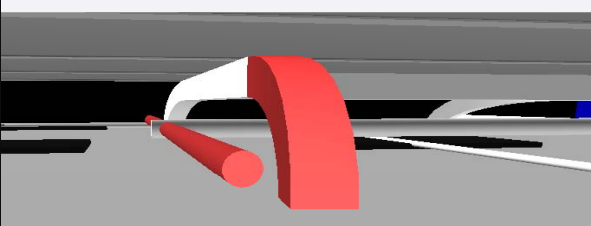


BIM CLASH DETECTION—Classroom

Human Error



Resolved





Group 2 : BIM²

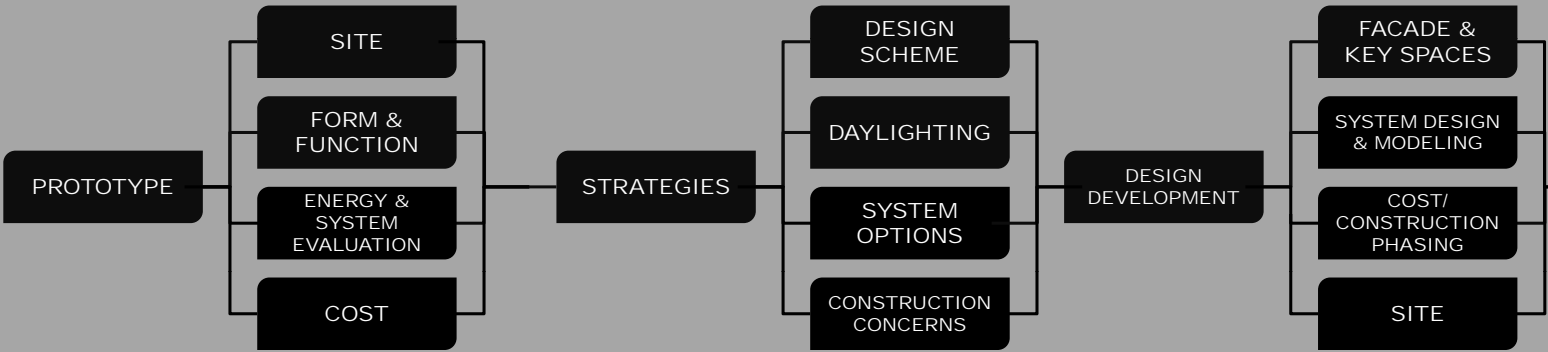
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



BIM CLASH DETECTION—Gymnasium

Human Error

Resolved

Group 2 : BIM²

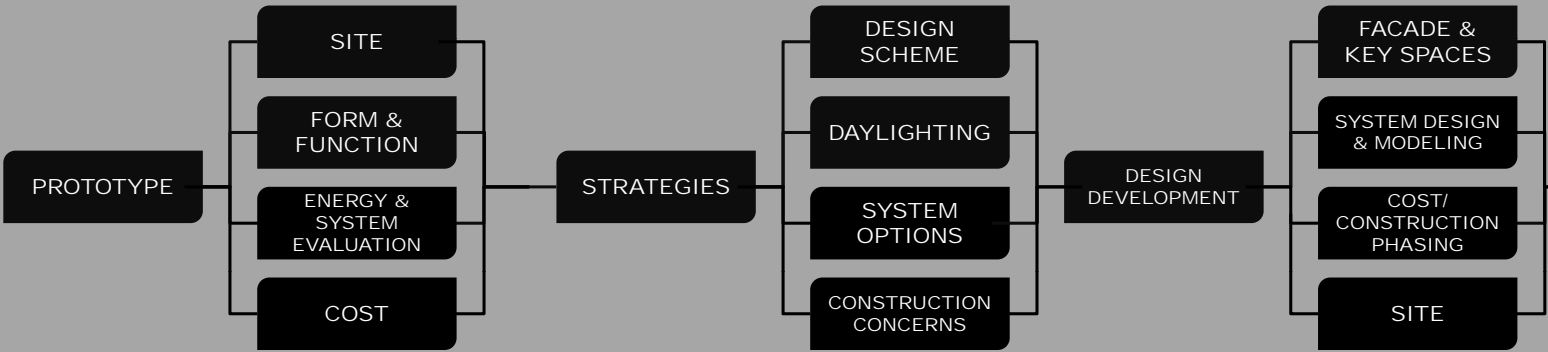
GOAL OVERVIEW

DESIGN TIMELINE

GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



STRUCTURE OPTIMIZATION

Family and Type	lb/ft	Count
K-Series Bar Joist Angle Web: 10K1	5	263
K-Series Bar Joist Angle Web: 12K1	5	29
K-Series Bar Joist Angle Web: 16K2	5.6	48
K-Series Bar Joist Angle Web: 16K4	7	14
K-Series Bar Joist Angle Web: 18K3	6.6	8

Member ID	Type	Dead Load (k)	Live Load (k)	Wind Load (k)	Seismic Load (k)
101	Beam	1.2	2.5	1.5	0.8
102	Beam	1.5	3.0	1.8	1.0
103	Beam	1.8	3.5	2.0	1.2
104	Beam	2.0	4.0	2.2	1.4
105	Beam	2.2	4.5	2.4	1.6

Member ID	Type	Dead Load (k)	Live Load (k)	Wind Load (k)	Seismic Load (k)
201	Column	3.0	6.0	3.0	1.5
202	Column	3.5	7.0	3.5	1.8
203	Column	4.0	8.0	4.0	2.0
204	Column	4.5	9.0	4.5	2.2
205	Column	5.0	10.0	5.0	2.5

Group 2 : BIM²

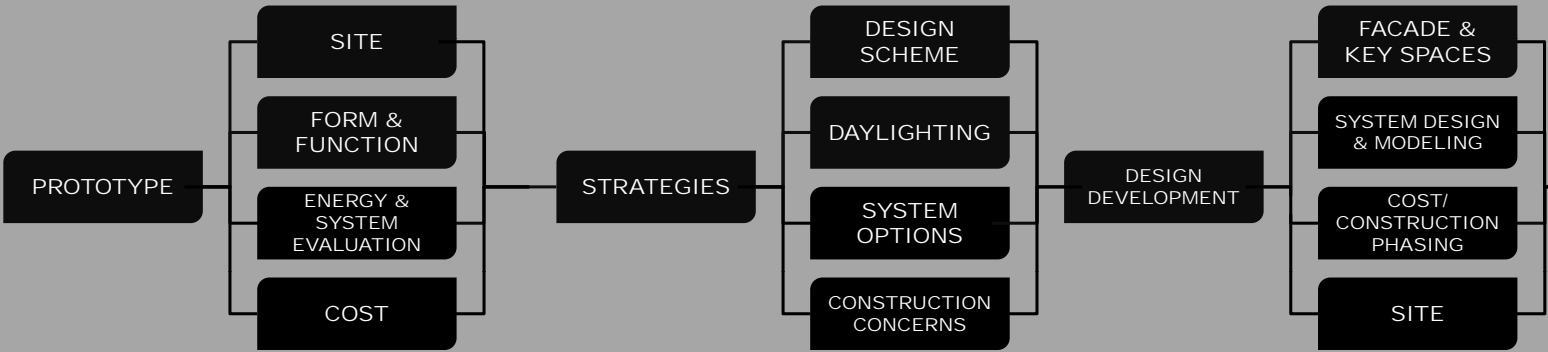
GOAL OVERVIEW

DESIGN TIMELINE

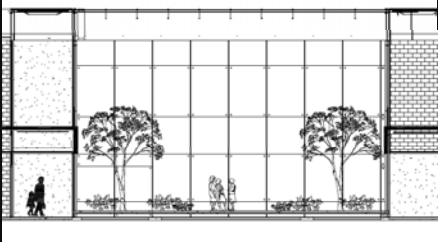
GOAL ACCOMPLISHMENTS

BIM OVERVIEW

ANDRES PEREZ - STRUCTURAL ENGINEER  
DAN COX - ELECTRICAL ENGINEER  
DYLAN SALMONS - LANDSCAPE ARCHITECT  
KAUSTAV GUPTA - ARCHITECT  
NICOLE DUBOWSKI - MECHANICAL ENGINEER  
NICK UMOSELLA - CONSTRUCTION MANAGER



ATRIUM



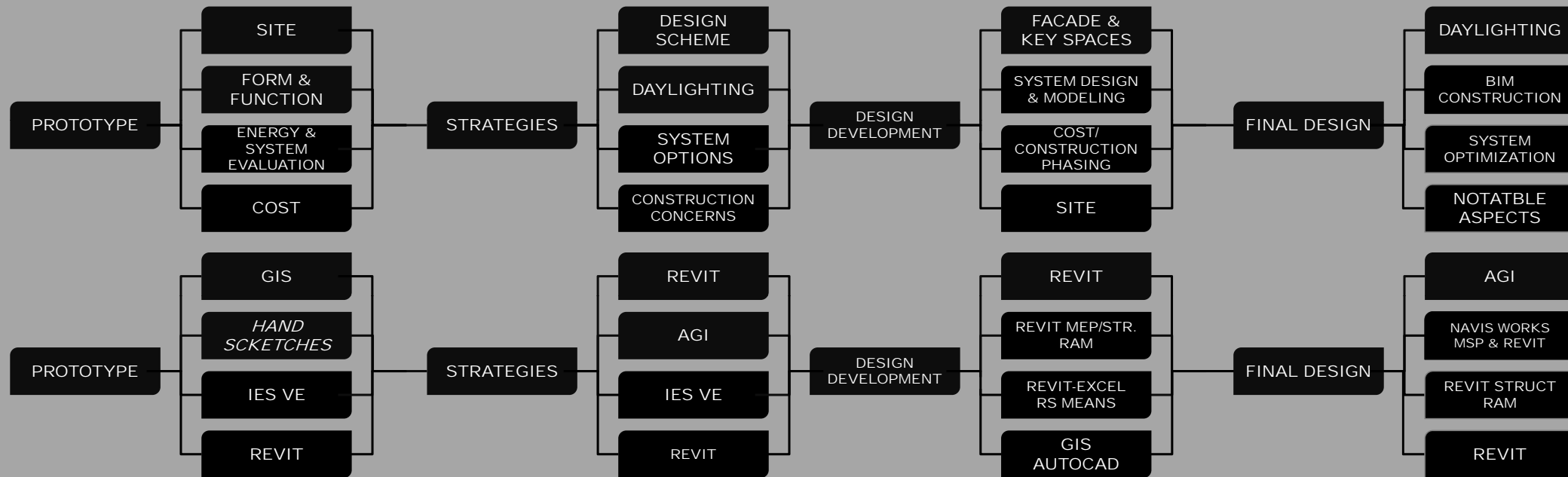
Group 2 : BIM²
GOAL OVERVIEW
DESIGN TIME LINE
GOAL ACCOMPLISHMENTS
BIM OVERVIEW
ANDRES PEREZ - STRUCTURAL ENGINEER DAN COX – ELECTRICAL ENGINEER DYLAN SALMONS – LANDSCAPE ARCHITECT KAUSTAV GUPTA - ARCHITECT NICOLE DUBOWSKI – MECHANICAL ENGINEER NICK UMOSELLA – CONSTRUCTION MANAGER

DESIGN GOALS

- 1. Beyond LEED 
- 2. Efficient collaboration amongst each other 
- 3. Effective Value Engineering 
- 4. Look at *Lifetime vs. Initial* cost 
- 5. System optimization through IPD and BIM 
- 6. Effective & beneficial educational environment for children 

Group 2 : BIM<sup>2</sup>

## BIM OVERVIEW



QUESTIONS?



INTEGRATED PROJECT DELIVERY